



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/588,292	06/07/2000	Naoya Eguchi	P00,0723	9151
26263	7590	04/05/2004	EXAMINER	
SONNENSCHN NATH & ROSENTHAL LLP			CARTER, AARON W	
P.O. BOX 061080			ART UNIT	
WACKER DRIVE STATION, SEARS TOWER			PAPER NUMBER	
CHICAGO, IL 60606-1080			2625	
			DATE MAILED: 04/05/2004	

18

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/588,292

Applicant(s)

EGUCHI, NAOYA

Examiner

Aaron W Carter

Art Unit

2625

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 June 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

Art Unit: 2625

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on December 19, 2003 has been entered.

Response to Arguments

2. Applicant's arguments, see paper number 12, pages 5 and 6, filed December 19, 2003, with respect to the rejection(s) of claim(s) 1 under 35 USC 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of US Patent 5,761,336 to Xu et al.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 2625

4. Claims 1-4, 6, 7 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 5,479,252 to Worster et al. ("Worster") (already of record) in view of US Patent 5,761,336 to Xu et al. ("Xu").

5. As to claim 1, Worster discloses an inspection equipment comprising:

means for supporting a specimen and moving the specimen to a predetermined position of inspection (column 4 line 66 – column 5 line 3 and lines 13-20);

means for projecting an ultraviolet light onto the specimen supported on the specimen supporting means (column 6, lines 4-11);

an ultraviolet imaging means for detecting a reflected or transmitted light from the specimen illuminated by the ultraviolet light projecting means to pick up an image of the specimen (column 6, lines 12-14); and

means for projecting a visible light to the specimen supported on the specimen supporting means (column 9, lines 61-63); and

a visible light imaging means for detecting a reflected or transmitted light from the specimen illuminated by the visible light projecting means to pick up an image of the specimen (column 10, lines 1-4);

means for processing the images picked up by the ultraviolet light imaging means and the visible light imaging means (column 10, lines 13-15).

Worster does not explicitly disclose processing selectively in response to the defect size of the specimen. However, Worster teaches us that the resolution provide by visible light imaging, 0.1 to 0.3 microns, is not suitable to resolve defects that are small in size (column 2,

Art Unit: 2625

lines 41-45) and he introduces a system that uses visible light imaging as well as ultraviolet light imaging that provides a better resolution, 0.1 to 0.2 microns, for small defect detection (column 4, lines 1-7). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to process the images picked up by the ultraviolet imaging means and the visible light imaging means selectively in response to the defect size of the specimen since it was known in the art that ultraviolet light imaging provides a better resolution for detecting small defects than the visible light imaging means as taught by Worster (column 2, lines 41-45 and column 4, lines 1-7).

Worster also does not explicitly disclose means for automatically making the selection between images picked up by the ultraviolet imaging means and the visible light imaging means. Worster requires the operator to manually select between images. However, Xu discloses an automatic review station for defect characterization (column 1, lines 52-55). Therefore it would have been obvious to one of ordinary skill at the time of the invention to take the inspection equipment disclosed by Worster and incorporate automatic defect characterization as taught by Xu, this providing the invention with the advantage of eliminating a fatiguing and highly repetitive task, reduce labor costs and providing improved consistency and accuracy over human operators (column 2, lines 5-7).

As to claim 2, the combination of Worster and Xu discloses the equipment as set forth in claim 1, Worster further discloses wherein

the image picked up by the visible light imaging means is processed and analyzed by the image processing means to inspect the specimen with a low resolution (column 10, lines 4-12,

wherein white light corresponds to visible light and it is inherent that inspection of the specimen is done at a lower resolution compared to the inspection with the ultraviolet laser image which inspects the specimen with a high resolution (column 6, lines 12-14)); and

the image picked up by the ultraviolet imaging means is processed and analyzed by the image processing means to inspect the specimen with a high resolution (column 6, lines 12-14).

As to claim 3, the combination of Worster and Xu discloses the equipment as set forth in claim 2, Worster further discloses wherein the image picked up by the visible light imaging means is processed and analyzed by the image processing means to inspect the low frequency component, and image picked up by the ultraviolet imaging means is processed and analyzed by the image processing means to inspect the high frequency component (column 4, lines 3-5, wherein the ultraviolet light contains shorter wavelengths that produce a higher resolution image and thus used to inspect higher frequency components. The same holds true for the white light image, it is inherent that the white light contains longer wavelengths than the ultraviolet laser and that produce a lower resolution image and thus used for inspecting lower frequency components), thus dividing the band of a space frequency to be inspected.

As to claim 4, the combination of Worster and Xu discloses the equipment as set forth in claim 2, Worster further discloses wherein:

The visible light imaging means comprises a lamp as a light source to project an incoherent light from the light source to the specimen (Fig. 3A, "White Light Lamp"); and

The ultraviolet imaging means comprises a laser as a light source to project a coherent light from the laser to the specimen (column 4, lines 3-5).

As to claim 6, the combination of Worster and Xu discloses the equipment as set forth in claim 1, Worster further discloses comprising:

a specimen placing mechanism for taking out the specimen having been carried in a predetermined container ("cassette"), from the container and placing it on the specimen supporting means ("vacuum chuck"), (column 5, lines 13-20); and

a dedusting clean unit to keep clean the internal environment (column 5, lines 5-7 and lines 21-24) wherein at least the specimen supporting means and specimen placing mechanism being provided inside the clean unit (column 5, lines 5-7 and lines 21-24).

As to claim 7, the combination of Worster and Xu discloses the equipment as set forth in claim 1, Worster further discloses wherein the ultraviolet imaging means comprises an ultraviolet laser source as a light source to project an ultraviolet laser from the light source to the specimen (column 4, lines 3-5).

As to claim 10, the combination of Worster and Xu discloses the equipment as set forth in claim 1, Worster further discloses wherein the specimen is a semiconductor wafer having a predetermined device pattern formed therein (column 3, lines 19-30 and column 5, lines 8-11).

Art Unit: 2625

6. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Worster and Xu as applied to claim 1 above, and further in view of U.S. Patent 5,619,429 to Aloni et al. ("Aloni")(previously of record).

As to claim 5, the combination of Worster and Xu discloses the equipment as set forth in claim 1, but neglects to explicitly disclose that the images of different areas of the specimen are picked up by the ultraviolet imaging means and the images are compared with each other by the image processing means to inspect the specimen. However Aloni teaches that as an alternative to using a database for providing a reference in a comparison based inspection, an area of the die may be used as a reference to inspect other areas of the same die (column 10, lines 42-47). Therefore it would have been obvious to one of ordinary skill in the art combine the invention of Worster, Xu, and Aloni. This would eliminate the requirement for a database to store reference images of the semiconductors.

7. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Worster and Xu as applied to claim 7 above, and further in view of an article entitled "All-Solid-State Tunable Ultraviolet Ce Activated Fluoride Laser Systems Directly Pumped by the Fourth and Fifth Harmonic of Nd: YAG Lasers" by Liu et al. ("Liu").

As to claim 8, the combination of Worster and Xu discloses the equipment as set forth in claim 7, Worster discloses wherein the ultraviolet laser source emits an ultraviolet laser having a shorter wavelengths than the optional multiline visible light laser (column 4, lines 1-7). It is known in the art that visible light consists of wavelengths between 400 and 700 nm, therefore

Art Unit: 2625

Worster is indicating that his ultraviolet laser has wavelengths of less than 400 nm, however Worster does not explicitly disclose that the ultraviolet laser has a wavelength of less than 355 nm. However, Liu teaches us that it is typical of an ultraviolet laser to have wavelengths in this range, listing several different types of ultraviolet laser, in figure 2, with wavelengths that fall into the range of 220 to 340 nm. Therefore it is obvious to one of ordinary skill in the art to say that the ultraviolet laser consists of wavelengths less than 355 nm, since it is known in the art that this is the nature of an ultraviolet laser.

As to claim 9, the combination of Worster and Xu discloses the equipment as set forth in claim 7, but neglects to explicitly disclose that the ultraviolet laser is a solid laser. However, it is known in the art that ultraviolet lasers can be solid-state-laser, see Liu, page 343, paragraph 1, lines 1-2. Therefore it would have been obvious to one of ordinary skill in the art say that the ultraviolet laser source is a solid laser since it is known in the art that an ultraviolet laser can be a solid-state laser.

8. Claims 11-13 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Worster and Xu as applied to claim 1 above, and further in view of USPN 4,514,858 to Novak.

As to claim 11, the combination of Worster and Xu discloses the equipment as set forth in claim 1, but neglects to explicitly disclose determining the size of the defect using the ultraviolet lights wavelength and the numerical aperture of its lens. However, Novak discloses wherein the size of a specimen is determined by the wavelength of the ultraviolet light emitted

Art Unit: 2625

from the means for projecting ultraviolet light and the numerical aperture of the ultraviolet lens used in the projecting means (column 5, lines 57-64). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the specimen size determining method as taught by Novak getting rid of the need for dual focus optics (column 6, line 2).

As to claim 12, please refer to rejection made for claim 3 above.

As to claim 13, please refer to rejection made for claim 4 above.

As to claim 15, please refer to rejection made for claim 6 above.

9. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Worster, Xu and Novak as applied to claim 11 above, and further in view of U.S. Patent 5,619,429 to Aloni et al. ("Aloni")(previously of record).

As to claim 14, the combination of Worster, Xu and Novak discloses the equipment of claim 11, but neglects to explicitly disclose that the images of different areas of the specimen are picked up by the ultraviolet imaging means and the images are compared with each other by the image processing means to inspect the specimen. However Aloni teaches that as an alternative to using a database for providing a reference in a comparison based inspection, an area of the die may be used as a reference to inspect other areas of the same die (column 10, lines 42-47). Therefore it would have been obvious to one of ordinary skill in the art combine the inventions of Worster, Xu, Novak and Aloni. This would eliminate the requirement for a database to store reference images of the semiconductors.

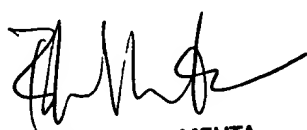
Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Aaron W Carter whose telephone number is (703) 306-4060. The examiner can normally be reached on 7am - 3:30 am (Mon. - Fri.).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on (703) 308-5246. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Awc
awc


BHAVESH M. MEHTA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600